May 11, 1966

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[redacted]

Declass Review by NGA.

ELECTROPHOTOGRAPHIC PROCESSING TECHNIQUES

STAT CONTRACT [redacted] TASK ORDER NO. 03(100,762)65-R

Monthly Narrative Report - April 1966

A. Current Status of Work

1. Second Interim Technical Report

The Second Interim Technical Report was edited, printed, and issued on April 25, 1966.

2. Electrical-Chemical Processing

The final modifications on the contact printer were completed, and the performance evaluation of the printer was initiated. An [redacted] Number 2 STAT 21 step calibrated density tablet was used for the density replication tests. Copies were made of this tablet in both the modulated and unmodulated printing modes with 8430 film, and microdensitometer traces made of the copies. Several different combinations of exposure time and control settings were tried to determine the best operational printing mode for different desired density ranges and incremental density steps. Some problems arose as a result of reflections producing non-imaging light at the printing level, but proper masking will eliminate these.

3. Electronic Processing

The assembly and wiring of the high resolution breadboard have been completed. Initial tests revealed that both the sensing and the modulating STAT kinescopes ([redacted] Model 9B/71) provide less light than expected as a result of discussions with the vendor prior to ordering the tubes. For the sensing CRT, this shows up as a poor signal-to-noise ratio in the negative mask picture. STAT A replacement tube ([redacted] Model 9B/24Q4) with lower resolution (i.e., a 1.7

mil spot instead of a 1 mil spot) has been loaned to us by the vendor to determine if it has sufficient light. It appears to be sufficient. A replacement (of the 9B/24 series) will be necessary for the modulating light CRT both to increase the light output and to match the sensing CRT for proper picture registration. It is important to have a ratio of brightness of at least 10 to 1 between the modulating and sensing tubes to minimize dilution by the sensing light. It should be noted that the use of the 9B/24 tubes will reduce the available masking resolution from the 60 cycles/mm hoped for with the 9B/71's to an expected 30 cycles/mm. This is still three times better than the mask resolution obtained on the low resolution breadboard. A new vacuum technique has been developed for holding the negative and copy film uniformly together and will be tested shortly.

4. Processing Techniques Analysis

The use of the mathematical models of both the "simple processor" (in which an unsharp negative mask is optically added) and the modulated-light, contact-image processor (in which masking is accomplished through multiplication) was continued. In particular, analysis of iterative processing of image edges was undertaken using the simple processor first. Assuming a square-aperture effective scanning slit and starting with a theoretical edge trace (intensity varying linearly within the edge) two iterations of processing were simulated. The results indicated that the edge "overshoot" effect is increased (on a normalized scale) by the second iteration. However, the usefulness of this effect must be considered in the light of decrease in absolute intensity and hence decrease in signal-to-noise ratio. Thus, the number of useful iterations must be limited. This analysis will be verified also for the contact-image processor model.

B. Problem Areas Encountered

STAT The two [redacted] tubes first utilized in the high resolution electronic processor did not provide sufficient light for proper system operation. As

noted above, replacements for both tubes are required. Only one such tube has been obtained on loan. The second tube must be obtained quickly in order for experiments to continue. In addition to schedule problems, additional costs may arise due to the need for these tubes. When detailed information is obtained, it will be communicated to the customer immediately.

C. Projected Work for Next Month

1. Electrical-Chemical Processing

   a. Complete the CRT printer capability tests.

   b. Use CRT printer in image improvement experiments program; use selected photographic scenes from AFSPPL film and others.

   c. Analyze scene processing experiment results to determine best sequence of processes for different types of image improvements.

2. Electronic Processing

   a. Make measurements of contact resolution using the new vacuum film-holding system.

   b. Prepare certain electronic equipment (e.g., driver amplifier, filters for positive masking) for positive and negative masking experiments.

   c. If replacement CRT tubes are obtained, incorporate them into system and initiate masking measurements and experiments.

3. Techniques Analysis

   Continue analysis with mathematical models of modulated light processors; in particular, concentrating on results of CRT contact printer.

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E. Documentation of Verbal Commitments and/or Agreements

STAT At a meeting at [redacted] April 27, 1966, it was agreed by [redacted] and the customer STAT
STAT that [redacted] effort on the electronic processor experiments should be concentrated on determining the feasibility, engineering requirements and the effects of high resolution positive and negative masking. However, it was recognized that CRT problems for this processor may limit the experimentation which could be accomplished. In particular, it appeared likely that experiments with both unidirectional and box scanning could not be accomplished in the remianing time and that the latter might have to be eliminated.